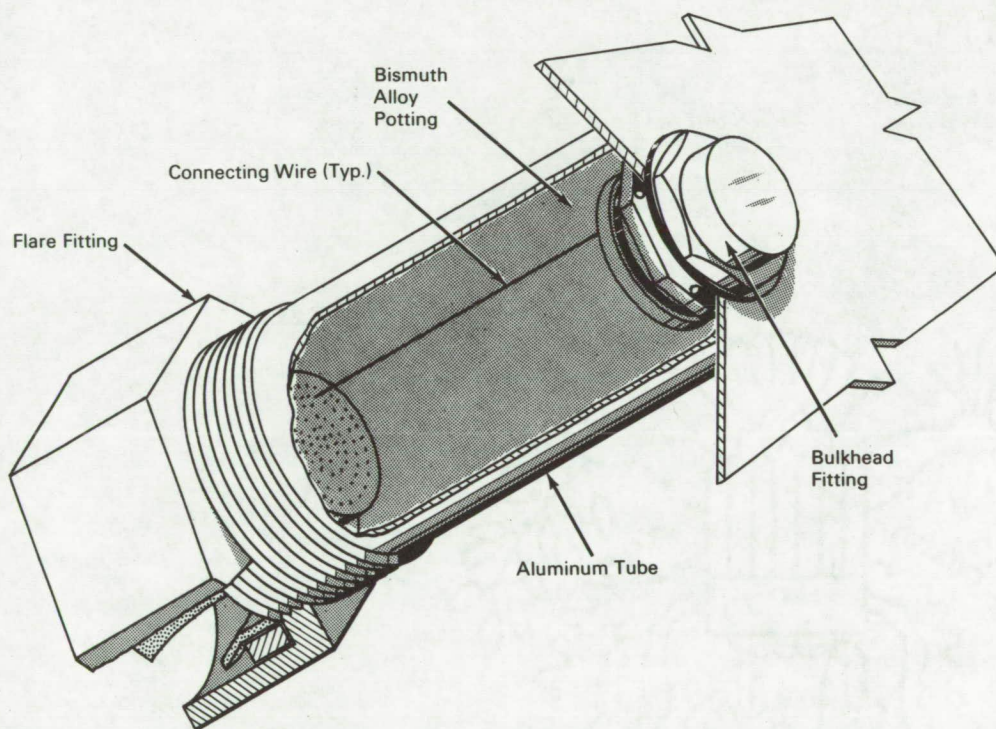


# NASA TECH BRIEF



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## Bismuth Alloy Potting Seals Aluminum Connector in Cryogenic Application



### The problem:

To provide a method of effectively sealing a feed-through electrical connector for instrumentation within a pressurized vessel filled with cryogenic liquids.

### The solution:

A seal that combines the transformation expansion of high-bismuth content alloys with the thermal contraction of an external aluminum tube.

### How it's done:

The feedthrough connector consists of an aluminum tube equipped with a standard flare fitting at one end and bulkhead fitting at the other. The fitting terminals are interconnected by copper wires with special insulation and the solder connections are encapsulated in an epoxy resin. Before sealing, the cavity of the tube is filled with a bismuth alloy having a melting point of from 158° to 255°F. During cooling, the alloy under-

(continued overleaf)

goes a transformation expansion that tends to fill the tube under a slight pressure. When the feedthrough is installed in the cryogenic liquid environment, the aluminum tube contracts thermally to increase the pressure between tube and bismuth alloy filler, thus forming an effective seal.

**Notes:**

1. This feedthrough has been used successfully at liquid nitrogen temperatures and at room temperatures to vessel pressures of 1,000 psi.
2. Voltage and current capacity far exceeds requirements for intended use with strain gauges, pressure or temperature sensors, liquid level indicators, etc.

3. Inquiries concerning this invention may be directed to:

Technology Utilization Officer  
Western Operations Office  
150 Pico Boulevard  
Santa Monica, California, 90406  
Reference: B66-10138

**Patent status:**

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C., 20546.

Source: Russell L. Stafford and John F. Flower  
of Douglas Aircraft Company, Inc.  
under contract to  
Western Operations Office  
(WOO-260)